

The Examiner objected to claims 27 and 28 as being duplicate claims. Claims 27 and 28 are not duplicate claims. Step (c) in claim 27 refers to transmission cycles, whereas step (c) in claim 28 refers to transmission periods.

### ***Prior Art Issues***

#### **1. Claim 1**

In the method of claim 1, each tag selects its own wake-up slot, thereby reducing the likelihood of collisions. This process, taken alone, is well-known in the prior art. However, the present invention uses the transmission cycle number as part of the wake-up slot selection process to further reduce the likelihood of collisions. Specifically, transmission cycles within a transmission period are defined, and then during each transmission cycle, a wake-up slot is selected based upon a different grouping of consecutive bits of the tag identification number. The different grouping are dependent upon the transmission cycle number. One embodiment of this process is illustrated in Fig. 2 and is described, in part, on page 5, line 17 through page 6, line 19 of the specification.

#### **Patentability of claim 1 over applied references**

The Examiner alleges that Tervoert (column 3, lines 16-46) and Conrad et al. (column 7, lines 12-28) would have suggested the wake-up slot scheme in claim 1 because both of these references disclose schemes that cycle through bits of the tag ID to select the wake-up slot. The Examiner admits that neither of these references disclose the use of a cycle number, but that a cycle number is implied by the shifting after each cycle in Tervoert (column 3, line 39) and the stepping in Conrad (column 7, line 22).

In response, neither of these references disclose or suggest the combination of steps set forth in claim 1.

a. Patentability of claim 1 over Tervoert: Some advantages of the wake-up time slot selection process in claim 1 are described, in part, on page 6, lines 20-28 of the specification, which reads as follows:

One conventional scheme for selecting wake-up time slots uses a combination of the transponder ID and a hash value sent by the reader. See, for example, U.S. Patent No. 5,539,394 (Cato et al.). In contrast to this scheme, the scheme in the present

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invention does not require any information from the reader. The transponder ID and transmission cycle number are both internally available within the transponder. Also, the scheme in the present invention does not have to generate and send a hash number. The reader used for the present invention can thus be less complex. Also, the chip in the transponder ID does not need a circuit to generate a random number from a received hash number, since the chip's internally programmed ID provides the random number. (underlining added for emphasis)

Referring to column 3, lines 16-46 of Tervoert, each tag has its own pseudo-random number generator which generates a number between 0 and 127 that serves as a starting number for a counter that counts down to 0. Therefore, different tags will reach 0 at different times. When the reader acknowledges the tag's first block of data, the reader changes the carrier frequency to 120 kHz (initially 119 kHz or 121 kHz). All tags which detect the change in the frequency, and whose counters have not yet reached counting from 127 to 0 are switched into a "passive mode" (sleep mode) by the carrier frequency change. This allows the reader to read one tag at a time in a so-called "selection procedure."

The initial pseudo-random number for each tag is selected by using a shift register that selects a portion of the bits in the random number. Thereafter, the bits in the shift register are shifted by one position, so that after a cycle a random number in binary form is again available (column 3, lines 38-41). The random number may also be formed by the pseudo-random generator in cooperation with the unique code of the relevant responder (column 3, lines 25-27).

Regardless of which scheme in Tervoert is used for the selection procedure, there is no disclosure in Tervoert of selecting a wake-up slot for each tag based upon different groupings of consecutive bits of the tag identification number, as explicitly recited in claim 1. At best, Tervoert discloses using the tag ID number in combination with the pseudo-random generator as part of the selection procedure. The resultant random number would have no relationship whatsoever to different groupings of consecutive bits of the original tag identification number. Tervoert's process is completely different than using the portions of the tag ID itself to select a wake-up time slot. In fact, Tervoert teaches away from the present invention which allows wake-up time slots to be selected without needing a circuit to generate a random number via a pseudo-random generator. Furthermore, it is unclear whether the cycle referred to in column 3, line 40 of Tervoert even has anything whatsoever to do with the claimed transmission cycle

number. In sum, Tervoert is completely lacking any disclosure or suggestion of at least step (b) of claim 1.

a. Patentability of claim 1 over Conrad: Conrad discloses a scheme on column 7, lines 12-28 wherein an algorithm steps through a 20 bit ID code at a rate of 4 bits at a time during each second, and then uses the current 4 bit part of the code to determine when the pulse bursts are to be transmitted within either a first or second portion of the one second period. However, Conrad is completely lacking any disclosure or suggestion of a transmission period comprising a plurality of consecutive tag transmission cycles, as explicitly recited in claim 1.

Conrad's system operates continuously to maintain a registry of the locations in a facility of tagged individuals and equipment, and stores and generates reports of a real time record of movement from location to location of the individuals and equipment (column 1, lines 8-14). Since Conrad's system operates continuously, the IR transmitters 18 must continuously emit their code bursts 40 shown in Fig. 3. Fig. 3 merely shows a 4 second period of time of the continuous emission, and not a defined transmission period, as shown in Fig. 2 of the present invention and as set forth in claim 1. Thus, there are no transmission periods comprising a plurality of tag transmission cycles in Conrad. Conrad continuously steps through the 20 bit ID code at a rate of 4 bits at a time during each second to decide when to send the code burst within the one second period and without any reference to a transmission cycle number, since none exists. Accordingly, the grouping of consecutive bits in Conrad is not related to a transmission cycle number. In sum, a cycle number is not implied by the shifting after each cycle in Conrad, as asserted in the Office Action.

For at least these reasons, claim 1 is believed to be patentable over each of the applied references.

## 2. Claim 5

Claim 5 is directed to a method that allows a tag to be decoupled from the environment in response to a command sent by an interrogator. Page 8, lines 3-11 of the specification discusses one advantage of this feature, and reads as follows:

In the conventional decoupling or detuning scheme, a transponder is programmed to detune itself automatically after it responds. The detuning process is thus not controlled by the interrogator or reader. One disadvantage of this scheme is that the reader loses

all control over if, or when, the transponder goes to sleep. In certain situations, it may be desirable to keep the transponder awake even after it has transmitted its ID.

In contrast to the conventional decoupling or detuning schemes, the present invention allows the reader or interrogator to control or initiate the decouple or detune process by sending MC1 when desired. (underlining added for emphasis)

Decoupling or detuning is one type of inactive mode. Another type of inactive mode involves turning off or deactivating a tag. This mode is conventionally referred to as a "sleep mode" or "quiet mode." These two types of inactive modes are discussed on page 7, line 24 through page 8, line 3, which reads as follows:

In one conventional inactive mode, the response circuitry of a transponder is turned off or deactivated. This mode is conventionally referred to as a "sleep mode" or "quiet mode." In this mode, the transponder is still capable of responding if turned back on or reactivated. No tag detuning occurs in the sleep mode.

In another conventional inactive mode, the transponder is "decoupled" or "detuned" by being tuned to a different frequency so that it cannot respond to an interrogation, even if its response circuitry is active. In a multiple tag environment, it is desirable to decouple read transponders so that they do not interfere with adjacent active transponders or with the receiver antenna of the interrogator or reader.

Sleep modes or quiet modes are thus clearly distinct from tag decoupling or detuning, even though both are inactive modes.

#### Patentability of claim 5 over applied references

The Examiner alleges that Cato (column 9, lines 22-26), Rochester (column 6, lines 23-33), Stobbe (column 6, lines 7-14), MacLellan (column 6, lines 15-65), Sharpe (column 21, line 51 through column 22, line 55), and Van Breeman (EP 439237) disclose the method of claim 5.

In response, these portions of Cato, Rochester, Stobbe, MacLellan and Sharpe actually disclose conventional sleep mode or quiet mode capabilities wherein the transponders are turned off or deactivated, but are still capable of responding if turned back on or reactivated. Van Breeman discloses a conventional fusible conductor portion and/or a capacitor which breaks down at an elevated voltage, not a decoupling scheme.

More specifically, the tag in Cato enters a "standby state" (column 9, line 23); the tag in Rochester enters a "wait state" (column 6, line 29); the tag in MacLellan enters a "quiet state" (column 6, line 20); and the tag in Sharpe enters a "silence period" (referred throughout column 21, line 51 through column 22, line 55). As discussed above, the tag in Van Breeman does not even enter an inactive mode. It undergoes physical destruction. None of these modes disclose or suggest a decoupling scheme, or an interrogator/reader that can send a command to initiate tag decoupling. For at least these reasons, claim 5 is believed to be patentable over each of the applied references.

### 3. Claim 6

Claim 6 is directed to a communication process wherein after tags are identified, they may be individually commanded to either perform a read or write transaction, or to enter an inactive mode. Claim 6 was amended to further recite that "the first and second command codes are calculated from a tag transmission cycle and only a portion of the tag identification number." thereby incorporating claim 7 therein (in addition to the newly claimed "portion" limitation). One embodiment of this feature is discussed on page 8, line 26 through page 9, line 5 of the specification, which reads as follows:

Fig. 4 shows the bit-wise equations for calculating the Matching Codes, and Fig. 5 shows an example of the match code for each transmission cycle for a specific tag ID. In the example of Fig. 4, Matching Codes are eight bits in length, and are calculated from the transponder ID and transmission counter. More specifically, the "match" part of the matching code (MC) is eight bits of the 32-bit tag ID echoed back to the tag after a fast read response in the detection loop of the anticollision flowchart of Figs. 1b-1d. The decision as to which tag ID bits to choose for respective codes is a function of the tag ID and TC. The modulo-32 portion of the calculation causes a "wrap-around" when calculating the matching code.

This scheme has numerous advantages over prior art schemes which address the identified tags by merely using their full identification codes obtained during the initial interrogation. By using only a portion of the tag ID, tag throughput is increased so more tags can be read in a given period of time. This increases the bandwidth efficiency of the communication process. Also, when a tag receives the matching code (i.e., the first or second commands), the length of the

matching code is shorter than if the entire tag ID was used, thereby allowing the tag to more quickly process received signals from the tag reader.

Patentability of claim 6 over applied references

The Examiner alleges that Cato (column 9, lines 27-30), Rochester (column 4, lines 4-55; column 4, line 63 through column 5, line 5; column 6, lines 7-22), Stobbe (column 6, lines 15-21 and column 5, line 61 through column 6, line 14), MacLellan (column 5, line 66 through column 6, line 65), and Sharpe (column 20, line 39 through column 22, line 55) disclose the steps in original claim 6.

Assuming, arguendo, that at least one of the applied references discloses or suggests the steps in original claim 6, none of the applied references disclose or suggest calculating the first and second command codes from “a tag transmission cycle and only a portion of the tag identification number,” as recited in amended claim 6.

More specifically, Cato merely addresses a command to the tag (column 9, line 28); Rochester sends a data packet containing the sensor ID (column 6, lines 16-17); Stobbe et al. merely describes that tag commands may include write/read or start/stop data transmission; MacLellan sends the full tag ID (Fig. 5); and Sharpe merely discloses that a particular transponder is requested to send data. Again, none of these references disclose or suggest calculating the first and second command codes from “a tag transmission cycle and only a portion of the tag identification number,” as recited in amended claim 6. For at least these reasons, amended claim 6 is believed to be patentable over each of the applied references.

The Examiner further alleges that Tervoert and Conrad, in combination with either Cato or Rochester, disclose or suggest the features in dependent claim 7, now incorporated into claim 6. Tervoert and Conrad disclose schemes for selecting wake-up slots and response waiting periods. More specifically, Conrad uses a portion of the tag ID to determine when to transmit a code burst. However, neither of these references have anything whatsoever to do with determining the command codes sent from the interrogator tag reader, as recited in claim 6. Accordingly, neither Tervoert nor Conrad make up for the deficiencies in the other applied references.

#### 4. Claim 10

Claim 10 is directed to the ability to send parameters of a read request to a tag as part of a tag read request command, and to have the tag use the parameters in its response. Claim 10 was amended to incorporate the limitations of dependent claim 19 which recites three specific parameters of the read request, namely, “the communications data rate of the tag reader, the number of time slots within each transmission cycle, and the maximum number of transmission cycles that the tag is allowed to broadcast in.” None of the applied references disclose or suggest this particular combination of parameters. These specific parameters allow the tags to be used in a wide variety of applications.

#### Patentability of claim 10 over applied references

The Examiner alleges that Cato (column 3, lines 31-43 and column 5, lines 29-55), Rochester (column 4, lines 31-55), Stobbe (column 5, line 61 through column 6, line 6 and column 6, lines 22-36), MacLellan (column 6, lines 40-45), and Sharpe (column 20, line 39 through column 22, line 55) disclose the steps in original claim 10.

Assuming, arguendo, that at least one of the applied references discloses or suggests the steps in original claim 10, none of the applied references disclose or suggest sending parameters of a read request including the communications data rate of the tag reader, the number of time slots within each transmission cycle, and the maximum number of transmission cycles that the tag is allowed to broadcast in, and a tag that responds to the read request using each of these parameters, as recited in amended claim 10.

At best, the applied references disclose or suggest sending and using only one of the parameters from a tag reader to a tag, such as the number of time slots or a communication data rate. Furthermore, Applicants have carefully reviewed each of the applied references and cannot find any disclosure or suggestion in any of the references relating to the parameter of the maximum number of transmission cycles that the tag is allowed to broadcast in. The unique combination of parameters, which allows tags made in accordance with the claimed invention to be used in a wide variety of applications, is nowhere disclosed or suggested by the applied references. Nor is it obvious to combine the references and thereby combine the parameters.

Claim 19, which is now incorporated into claim 10, was rejected over Tervoert and Conrad, in combination with either Cato or Rochester. However, neither of these references

have anything whatsoever to do with setting parameters of read requests or using such parameters to respond to read requests, as recited in claim 10. Accordingly, neither Tervoert nor Conrad make up for the deficiencies in the other applied references.

For at least these reasons, amended claim 10 is believed to be patentable over each of the applied references.

#### 5. Claim 20

Claim 20 recites creating a new sleep ID number during each transmission cycle by a cyclic rotation of the bits of the number. The transponder is then set in an inactive mode for one transmission cycle whenever a predetermined bit of each new sleep ID number has a selected logic level.

One embodiment of this claimed feature is described on page 14, line 12 through page 15, line 2, which reads as follows:

#### (3) HALVING NUMBER OF ACTIVE TRANSPONDERS AND FURTHER RANDOMIZATION WAKE-UP TIME SLOT

The anticollision flowchart of Figs. 1a-1d may remove undetected transponders and further randomize time slot assignments by inactivating transponders with even numbered sleep ID's and by performing a binary rotation of the transponder ID used for the wake-up time slot calculation.

Referring to the Detection loop in Figs. 1b-1d, when the transmission counter has elapsed, or when  $TC=TCMAX$  and  $TCMAX=1$ , the transponder rotates the sleep ID by one bit for use in the wake-up slot calculation shown in Fig. 7. If  $TC=TCMAX$  and  $TCMAX>1$ , then a test is made on bit 0 of the transponder ID. If  $ID_0=0$ , a binary rotation is performed on the sleep ID for the purpose of a wake-up slot calculation. Transponders with  $ID_0=1$  are rendered inactive (e.g., by being detuned in the disclosed example, or by being put to sleep in an alternative embodiment) for the duration of the 16 or 64 time slots, thereby allowing approximately half of the transponders (with  $ID_0=0$ ) to have the opportunity to broadcast their fast read response.

This feature is useful if a large number of transponders have similar ID's, and were not read in the first pass of a fast read request and fast read responses. It allows the user to resolve two times the maximum number of tags for a given number of time slots, since the technique restricts (statistically) one-half of the tags from broadcasting.



The Examiner alleges that Cato or Rochester, in combination with either Tervoert or Conrad, disclose or suggest the steps in claim 20. Specifically, the Examiner relies upon Tervoert and Conrad as disclosing or suggesting the creation of the sleep ID from a cyclic rotation of bits of a tag ID number.

In response, neither Tervoert nor Conrad have any disclosure or suggestion of a sleep ID number, which is different from a tag ID and selection of wake-up slots. As discussed above, Tervoert and Conrad disclose schemes for selecting wake-up slots and response waiting periods. More specifically, Conrad uses a portion of the tag ID to determine when to transmit a code burst. Neither of these concepts have anything whatsoever to do with sleep ID numbers, or the use of such a number to set a transponder in an inactive mode for one transmission cycle. In a typical operation, tags are still assigned wake-up slots, even when the sleep ID is being used. As shown by the title of the specification portion highlighted above, the sleep ID is used in one embodiment of the invention to halve the number of active transponders and further randomize wake-up time slots. No such functions are disclosed or suggested in Tervoert, Conrad, Cato or Rochester.

For at least these reasons, claim 20 is believed to be patentable over each of the applied references.

#### 6. Claim 23

Claim 20 recites the ability to selectively place a tag in a tag-talk-first mode or a read-talk-first mode, in contrast to conventional tags which are preprogrammed to operate in one or the other of these modes. This feature is discussed on page 12, line 21 through page 13, line 16 of the specification, which reads as follows:

A tag-talk-first mode is used for applications where the transponder is in the field for a limited amount of time, such as in high speed conveyor and/or sorting systems. In this mode, the transponder sends its data immediately upon power-up.

In the preferred embodiment, a bit is set in the transponder to indicate Tag-Talk-First, which is bit 30 of the first data block in the transponder. When the bit is cleared, the transponder only become active in response to a reader command sequence or in Reader-Talk-First Mode.

Conventional transponders are designed to operate in either a tag-talk-first mode or a reader-talk-first mode and have no ability to be reprogrammed to operate in a different mode. The inflexibility of conventional transponders to operate in either mode limits their usefulness. A conventional reader-talk-first transponder may be unable to respond in sufficient time in applications where the transponder is in the interrogation field for a limited amount of time (e.g., a conveyor or sorting system). Alternatively, a conventional tag-talk-first transponder may be undesirable in environments where reader control of transponder responses is important and transponder response time is not a concern. Furthermore, a transponder may be exposed to a plurality of different read environments throughout its life cycle, some which may favor a tag-talk-first protocol and others which may favor a reader-talk-first protocol. Prior to the present invention, the user had to weight the advantages and disadvantages of each protocol and had to select a transponder which best met the user's needs and had to accept the drawbacks of the selected option. The present invention allows the user to select the best option at the appropriate time in the life cycle of the transponder by merely changing one bit in the transponder memory.

Patentability of claim 23

The Examiner alleges that Rochester (no text portions or explanations given) and Stobbe (column 4, lines 47-48 and column 6, lines 7-22) disclose the steps in claim 23.

In response, neither of these references disclose or suggest the ability to selectively place a tag in a tag-talk-first mode or a read-talk-first mode, as recited in claim 23. The sensors in Rochester operate only in a read-talk-first mode because the sensors send their ID's only in response to a Poll Packet signal that specifically requests sensor ID's (column 4, lines 33-37). The sensors have no other communication protocol. Column 4, lines 47-48 of Stobbe appears to suggest that the microchip 26 operates in a tag-talk-first mode. Column 6, lines 7-22 of Stobbe describe two different modes of the microchip 26 that relate to shutting off the microchip 26 after it is detected in the RF field and reactivating previously shut off microchips 26. These modes have nothing whatsoever to do with a tag-talk-first mode, a read-talk-first mode, or the ability to selectively switch therebetween. In sum, Rochester and Stobbe are examples of conventional transponders that are designed to operate in either a tag-talk-first mode or a reader-talk-first mode and have no ability to be reprogrammed to switch between these two modes, as discussed in the specification.

For at least these reasons, claim 23 is believed to be patentable over each of the applied references.

## 7. Claim 29

Claim 29 includes all of the limitations of claims 10, 11 and 15, as well as additional clarifying language. This claim is directed specifically to the fast read request feature. One embodiment of this feature is described on page 7, lines 2-12; and on page 12, lines 4-8 of the specification, which reads as follows:

The RFID reader or interrogator broadcasts commands to all transponders present in the detection field. All command sequences from the reader begin with a fast read request which includes the read request, as well as at least one parameter of the read request. Parameters include the communications data rate of the tag reader (e.g., Normal or Fast Mode), the number of time slots within each transmission cycle, and the maximum number of transmission cycles that the tag is allowed to broadcast in (TCMAX). The request for a fast read, along with the respective parameter information, are communicated to the transponder via a series of "gaps," or timed drop-outs in the RF field. In the preferred embodiment, these pulses are sent in groups of four, and occur over a 1.4 msec interval. Each tag responds to the fast read request by sending its ID, and other data including tag parameters and fast read field data. (page 7, lines 2-12)

Special commands are available to explicitly set the Fast Read Bit to a "1" or "0." If the bit is set to a "1," the transponder sends out a fast read response message if the reader issues a fast read request. If the bit is cleared to "0," the transponder will not respond to a fast read request message. To allow for processing on a transponder which has its Fast Read Bit cleared, the reader must first issue a fast read bypass command. (page 12, lines 4-8)

The Examiner alleges that claim 15 (now incorporated into claims 10 and 11) is disclosed or suggested by MacLellan (rapid data transfer mode) or the combination of Stobbe, MacLellan and Sharpe (columns 16-17). In response, Applicants assert that none of these references disclose or suggest the combination of steps recited in claim 15.

With respect to MacLellan, the rapid data transfer mode in this patent does not allow a tag to respond to a fast read command by sending its tag ID and data in a fast read field, as required by claim 29. To the contrary, no data (other than the tag ID data) is sent from the tag to the interrogator in MacLellan until after the presence of the tag is ascertained by the interrogator (column 6, lines 15-65). The interrogator then decides if it wants to communicate with the tag in a rapid data transfer mode or in a slower, less time critical mode (column 3, lines 67). Accordingly, MacLellan's rapid data transfer mode or "fast read mode" (as it is referred to in

Fig. 5) is not the same or even similar to the claim 29 fast read request feature which allows data in a fast read field to be piggybacked with tag ID number when responding to an initial read request. Furthermore, claim 29 recites the ability to turn on and off the ability to respond to the fast read request in the tag command. Since MacLellan lacks anything resembling the claimed fast read mode, MacLellan also lacks the ability to turn on and off such a feature.

With respect to Sharpe, Applicants have carefully reviewed columns 16-17 and cannot find any text that is relevant to claim 29. Sharpe appears to be wholly irrelevant to the fast read request feature. Applicants have also carefully reviewed Stobbe and cannot find any function modes that provide the function of the fast read request feature.

For at least these reasons, claim 29 is believed to be patentable over each the references that were applied to original claim 15.

8. Patentability of dependent claims 2-4, 8-9, 11-14 and 21-28

Claims 2-4, 8-9, 11-14 and 21-28 are believed to be patentable for at least the reason that they are dependent upon patentable independent claims.

***Conclusion***

Insofar as the Examiner's rejections have been fully addressed, the instant application is in condition for allowance. A Notice of Allowability of all pending claims is therefore earnestly solicited.

Respectfully submitted,

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Marked-up Version of Claims

6. **(Amended)** A method of controlling actions of radio frequency identification (RFID) tags, each tag including an identification number, the method comprising:

- (a) sending a tag read request from an interrogator tag reader;
- (b) receiving tag response signals from tags within an interrogation zone of the tag reader, the tag response signals including the tag identification numbers; and
- (c) sending a first or second command code from the interrogator tag reader to each of the tags which responded to the read request, the first command code causing a tag to perform read or write transactions, and the second command code causing a tag to enter an inactive mode, each command code being individually directed to one of the responding tags, wherein the first and second command codes are calculated from a tag transmission cycle and only a portion of the tag identification number.

10. **(Amended)** A method of controlling actions of radio frequency identification (RFID) tags, the method comprising:

- (a) sending a tag command from an interrogator tag reader, the tag command including:
  - (i) a read request, and
  - (ii) [at least one] a plurality of parameters of the read request including the communications data rate of the tag reader, the number of time slots within each transmission cycle, and the maximum number of transmission cycles that the tag is allowed to broadcast in; and
- (b) a tag receiving a tag command and responding to the read request using [the at least one] each of the received parameters, wherein the tag responds to the read request in one of a plurality of time slots associated with consecutive transmission cycles.

13. **(Amended)** A method according to claim 11 further comprising:

- (d) sending a read bypass command from the tag reader; and
- (e) the tag receiving the read bypass command, and if the [fast] read bit is set to the second logic level, the read bypass command causes the tag to transmit its identification data and enter a processing loop.

29. **(New)** A method of controlling actions of radio frequency identification (RFID) tags, each of the tags including a read bit, a tag identification number, and data in a fast read field, the method comprising:

- (a) sending a tag command from an interrogator tag reader, the tag command including:
  - (i) a fast read request, and
  - (ii) at least one parameter of the read request;
- (b) a tag receiving a tag command and responding to the fast read request using the at least one received parameter, the tag response including at least the tag identification number and the data in the fast read field; and
- (c) setting the read bit to a first logic level to allow the tag to respond to the fast read request in the tag command, or setting the read bit to a second logic level to prevent the tag from responding to the fast read request in the tag command.